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INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

(51) International Patent Classification ⁶ : C11D 3/00, 1/62, 1/835		A1	(11) International Publication Number: WO 98/56886 (43) International Publication Date: 17 December 1998 (17.12.98)
(21) International Application Number: PCT/IL98/00232		(81) Designated States: AL, AM, AT, AU, AZ, BA, BB, BG, BR, BY, CA, CH, CN, CU, CZ, DE, DK, EE, ES, FI, GB, GE, GH, GM, GW, HU, ID, IL, IS, JP, KE, KG, KP, KR, KZ, LC, LK, LR, LS, LT, LU, LV, MD, MG, MK, MN, MW, MX, NO, NZ, PL, PT, RO, RU, SD, SE, SG, SI, SK, SL, TJ, TM, TR, TT, UA, UG, US, UZ, VN, YU, ZW, ARIPO patent (GH, GM, KE, LS, MW, SD, SZ, UG, ZW), Eurasian patent (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM), European patent (AT, BE, CH, CY, DE, DK, ES, FI, FR, GB, GR, IE, IT, LU, MC, NL, PT, SE), OAPI patent (BF, BJ, CF, CG, CI, CM, GA, GN, ML, MR, NE, SN, TD, TG).	
(22) International Filing Date: 21 May 1998 (21.05.98)			
(30) Priority Data: 121037 9 June 1997 (09.06.97) IL			
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(54) Title: LAUNDRY FABRIC SOFTENER WHICH INHIBITS BACTERIAL GROWTH AND ODOR FORMATION

(57) Abstract

An antibacterial fabric softener composition suitable for imparting antibacterial properties to a fabric, comprising one or more cationic antibacterial agent(s) in an amount in excess of the amount needed for antibacterial activity in the softener, together with conventional fabric softener components.

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LAUNDRY FABRIC SOFTENER WHICH INHIBITS BACTERIAL GROWTH AND ODOR FORMATION

Field of the Invention

The present invention relates to the treatment of laundry. More particularly, the invention relates to formulations which, when added to a laundry cycle, act as fabric softeners and antibacterial, deodorizing and anti-fouling agents.

Background of the Invention

The most common rinse-added fabric softeners are compositions combined with anionic or non-ionic esters. Diester quaternary ammonium compounds with fatty acid alkyl sulfate or alkyl sulfonate anion are disclosed in European Patent No. 336 267. U.S. Patent No. 4,808,321 teaches fabric softener compositions comprising monoester analogs of ditallow-dimethyl ammonium salts. U.S. Patent No. 4,401,570 discloses hydrocarbons, fatty acid esters and fatty alcohols as viscosity control agents for fabric softeners. Most fabric softener products contain an amount of perfume. It has been discovered that esters of certain non-ionic and anionic non-allylic perfume alcohols are particularly well suited for fabric softening compositions and detergent compositions, as described in European Patent Application Publication No. 404 470 and U.S. Patent No. 5,531,910; and in the process for scenting fabrics washed with lipase-containing detergents described in PCT Application No. WO 95/04809.

Examples of bactericides that can be used in the composition of fabric softeners comprise parabens, especially formaldehyde, 2-bromo-2-nitropropane-1,3-diol, sold by Indolex Chemicals under the trade name Bronopol, and a mixture of 5-chloro-2-methyl-4-isothiazoline-3-one and 2-methyl-4-isothiazoline-3-one (MIT), sold by Rohm and Haes Company. Typical levels of bactericides used range from about 1 ppm to about 2000 ppm by weight, depending on the type of bactericide selected. Such preservatives are added to preserve the liquid softener composition itself and for the purpose of preventing growth of bacteria in the liquid composition during storage. These preservatives, therefore, play no longer a role once the softener is used in the laundry cycle, because their residual amount is too low.

Additionally, according to the known art, very small amounts of preservatives are used, as said, a few ppm, to avoid their interference with the softener composition, which may affect its efficacy, and reduce the softness of the laundry treated therewith.

A typical fabric softener composition is as follows:

- 0 to 0.1% benzalkonium chloride or other preservative;
- 0 to 1.0% nonyl phenol 10EO (nonionic detergent NP10)
- 1.0 to 15% Marlosoft IQ90 (imidazolinium type fabric softener)
- 0.2% to 1.0% perfume
- 0 to 5% ethanol
- Water to 100%.

SUMMARY OF THE INVENTION

It has been surprisingly found, and this is an object of the present invention, that it is possible to obtain antimicrobial activity in the fabric itself, after laundry, while maintaining the softening activity of the softener.

It is an object of the present invention to provide softening compositions for use in the laundry of fabric, which are capable of imparting antimicrobial, anti-fouling and anti-odor properties to a fabric.

It is another object of the invention to provide a composition which, while containing relatively high amounts of antimicrobial agents, still possess fabric softening activity.

It is yet another object of the invention to provide a method for making a fabric resistant to microbial attack and related fouling and odor, particularly a fabric which becomes moist or wet with use, such as a towel.

Other objects of the invention will become apparent as the description proceeds.

The invention provides, *inter alia*, an antibacterial softener composition suitable for imparting antibacterial properties to a fabric, comprising one or more cationic antibacterial agent(s) in an amount in excess of the amount needed for antibacterial activity in the softener,

together with conventional fabric softener components. According to a preferred embodiment of the invention, the fabric softener composition comprises from about 0.2% to about 10% cationic antibacterial agent. Preferably, but non-limitatively, the cationic antibacterial agent is selected from among benzalkonium chloride and quaternary ammonium compounds. Illustrative and non-limitative examples of the suitable quaternary ammonium compounds are alkyl dimethyl benzyl and dialkyl dimethyl ammonium chloride, didecyl dimethyl ammonium chloride, mixed dialkyl dimethyl ammonium chloride, dioctyl dimethyl ammonium chloride, alkyl dimethyl benzyl ammonium chloride, dialkyl methyl benzyl ammonium chloride, and alkyl dimethyl ethyl benzyl ammonium chloride.

According to another preferred embodiment of the invention, the fabric softener comprises up to about 1% of non-ionic detergent. Illustrative and non-limitative examples of suitable non-ionic detergents are nonyl phenol 10EO, and alcohol ethoxylates.

According to still another preferred embodiment of the invention, the composition contains up to about 15% of a fabric softener. Illustrative examples of suitable fabric softeners include (but are not limited to) Marlosoft IQ90 imidozolinium type fabric softener, esterquats types (e.g., Servosoft XW 490), DMDT AC types (e.g., Quartamin D-86 of Kao Corp.), and amidoamine types (e.g., Incrosoft T-90 of Croda). Unless otherwise stated, all percentages given herein are by weight.

Typically, the composition is provided in an aqueous liquid carrier, although other liquids can also be included.

The invention is also directed to a method for imparting anti-fouling, anti-odor and antimicrobial properties to a fabric, which method comprises adding to the final rinse cycle of textile laundry a composition according to the invention.

The advantages of the invention are particularly evident when the textile material treated is one which is used under damp or wet conditions, such as a towel. In such a case, the towel washed in a laundry cycle according to the prior art becomes polluted with body bacteria when used, which bacteria grow under moist conditions induced by the act of toweling, and result in a bad odor of the towel. The invention prevents this occurrence by providing residual antibacterial activity in the towel treated according to the invention. By "residual antibacterial activity", it is meant to indicate that the antibacterial activity is carried over to the towel, after the laundry/drying cycle is concluded, which activity becomes felt when the towel (or other fabric) is used under conditions that may promote bacterial growth.

All the above and other characteristics and advantages of the invention will be better understood through the following illustrative and non-limitative examples of preferred embodiments thereof.

Experimental Methods

The following general sampling method was used in the examples to follow.

Method of Microbial Sampling: A Diaslide (Rosenberg et al., U.S. Patent No. 4,801,547, "Device for detecting presence of microorganisms in a sample") was passed along the length of the towel and back, i.e., with the Diaslide fingers touching the towel material gently, at an angle. The insert was then pulled through and the Diaslide incubated at 37°C overnight. The number of microorganisms was judged according to the scale for urinary tract infections (since the urinary tract sampling is from liquid, the two are not the same; thus, the numbers should be treated as being relative).

Example 1

Preparation of a Softening Composition

A softening composition was prepared, according to a preferred embodiment of the invention, as detailed in Table I below. The components were thoroughly mixed together, and a stable composition was obtained.

Benzalkonium chloride was chosen as the representative cationic antibacterial agent in the examples to follow.

Table I

<u>Component</u>	<u>Wt%</u>
Benzalkonium chloride	5.6
nonyl phenol 10EO (non-ionic detergent)	1.0
Marlosoft IQ90	1.0
perfume	1.0
water	to 100

Example 2

Four towels (two regular bathroom towels and two kitchen towels) were washed, all with the same regular laundry detergent, after which a bathroom towel and a kitchen towel were left in a bowl containing 5 ml Badin softener (manufactured by Witko), for 30 minutes. The other two towels underwent the same treatment, but instead of Badin, the composition of Example 1 was used.

A volunteer took a bath with no soap, in order to inoculate the bath water with body organisms. The towels were then rinsed and air-dried. The towels were then soaked in the bath water and wrung by hand until moist and allowed to hang in a closed room. One day later, towels were sampled in duplicates using the Diaslide (microbiologically) and assessed organoleptically by several judges, who scored each towel on a 0 (no odor) to 5 (worst possible odor) basis.

Results

No difference was found between the two kitchen towels. The following differences were found between the two bathroom towels:

Table II

	<u>Example 1 Formulation</u>	<u>Commercial Formulation</u>
Odor*	0.8	2.8
Bacterial counts		
CLED agar	10^4	10^7
Maconkey agar	10^4	10^7

*average score of three judges

Example 3

Example 2 was repeated, but the following changes were made:

- (1) four bathroom towels were tested; and
- (2) each pair of towels was washed separately and the softeners were added to the washing machine at the beginning.

Results

The results are given as averages between each pair of towels.

Table III

	<u>Example 1 Formulation</u>	<u>Commercial Formulation</u>
Odor*	0.1	2.5
Bacterial counts		
CLED agar	3.9×10^5	6.5×10^6
Maconkey agar	1.8×10^4	7.5×10^5

*average score of three judges

Example 4

Example 3 was repeated, but the following changes were made:

- (1) towels were dipped in tap water rather than bath water; and
- (2) Diaslides were applied directly following wetting(time 0), as well as following one day standing (24 hours).

Results

The results are given as averages between each pair of towels.

Table IV

	<u>Example 1 Formulation</u>	<u>Commercial Formulation</u>
Odor*	0.25	2.6
Bacterial counts (at time 0)		
CLED agar	<10 ³	8 x 10 ⁵
Maconkey agar	<10 ³	5 x 10 ³
Bacterial counts (24 hours)		
CLED agar	1.2 x 10 ⁵	4 x 10 ⁶
Maconkey agar	4.0 x 10 ⁵	3.7 x 10 ⁵

*average score of three judges

As will be appreciated by the skilled person, it is surprising that not only did the formulation provide dramatic residual antibacterial and antifouling activity on the fabric, but it was also deemed to be equivalent in its softening characteristics to a commercial fabric softener.

Example 5

The antibacterial effect of eleven different softener compositions was tested *in vitro* versus three different microorganisms: *C. xerosis*, *S. epidermidis*, and *E. coli*.

The composition of the softener formulations is detailed in Table V below.

Table V

Component wt%	Softener Nos.									
	3	4	5	6	7	8	9	10	11	
Preventol 80 (80%)	7	-	-	6	6	1	2.25	3.5	4.75	
NP 10	1	1	1	1	1	1	1	1	1	
Water	80	91	91	91	91	91	91	91	91	
Marlosoft IQ90	1	1	1	-	1	6	4.75	3.5	2.25	
Perfume	1	1	1	1	1	1	1	1	1	
CPC (100%)	-	6	-	-	-	-	-	-	-	
Barquat 4280Z* (80%)	-	-	6	-	-	-	-	-	-	
Esterquat (90%)	-	-	-	1	-	-	-	-	-	

*alkyl dimethyl benzyl ammonium chloride (B.C.) + alkyl dimethyl ethyl benzyl ammonium chloride

The results obtained are detailed in Table VI:

Table VI

Softener No.	Description	Inhibition of <i>C. xerosis</i>	Inhibition of <i>S. epidermidis</i>	Inhibition of <i>E. coli</i>
3	Homogenous (with small flowing lumps).	+, 2.5 cm	+, 2.3 cm	+, 1.4 cm
4	Biphasic. Lower-transparent (with small lumps). Upper-narrow, opaque.	+, 1.5 cm	+, 1.3 cm	+, 0.9 cm
5	Same as 4.	+, 2.0 cm	+, 1.6 cm	+, 1.0 cm
6	Biphasic. Lower- narrow, opaque. Upper- transparent (with small lumps).	+, 2.5 cm	+, 2.3 cm	+, 1.4 cm
7	Same as 3.	+, 2.7 cm	+, 2.3 cm	+, 1.3 cm
8	Milky, homogenous.	+, 2.0 cm	+, 1.6 cm	+, 0.8 cm
9	Same as 8.	+, 2.0 cm	+, 2.0 cm	+, 1.0 cm
10	Same as 8.	+, 2.2 cm	+, 2.1 cm	+, 1.1 cm
11	Opaque.	+, 2.5 cm	+, 2.2 cm	+, 1.2 cm

All the above description and examples have been provided for the purpose of illustration, and are not intended to limit the invention in any way. Many changes can be made: for instance, different cationic antibacterial agents can be used, as well as various detergents, softeners, additives, scents and carriers, all without exceeding the scope of the invention.

CLAIMS:

1. An antibacterial fabric softener composition suitable for imparting antibacterial properties to a fabric, comprising one or more cationic antibacterial agent(s) in an amount in excess of the amount needed for antibacterial activity in the softener, together with conventional fabric softener components.
2. A composition according to claim 1, wherein the cationic antibacterial agent is selected from among benzalkonium chloride, quaternary ammonium compounds, and their mixtures.
3. A composition according to claim 2, wherein the cationic antibacterial agent is benzalkonium chloride.
4. A composition according to claim 2, wherein the quaternary ammonium compounds is selected from among alkyl dimethyl benzyl and dialkyl dimethyl ammonium chloride, didecyl dimethyl ammonium chloride, mixed dialkyl dimethyl ammonium chloride, dioctyl dimethyl ammonium chloride, alkyl dimethyl benzyl ammonium chloride, dialkyl methyl benzyl ammonium chloride, and alkyl dimethyl ethyl benzyl ammonium chloride.
5. Fabric softener according to any one of claims 1 to 3, wherein the composition comprises from about 0.2% to about 10% cationic antibacterial agent.

6. Fabric softener according to any one of claims 1 to 5, wherein the conventional fabric softener components comprise up to about 1% nonyl phenol 10EO (nonionic detergent NP10).
7. Fabric softener according to any one of claims 1 to 6, wherein the conventional fabric softener components comprise up to 15% Marlosoft IQ90 (imidozolinium type fabric softener).
8. Fabric softener according to any one of claims 1 to 7, wherein the composition is provided in an aqueous liquid carrier.
9. Fabric softener according to any one of claims 1 to 8, wherein the composition is suitable to be added to the final rinse cycle of textile laundry.
10. A method for imparting anti-fouling, anti-odor and antimicrobial properties to a fabric, comprising adding to the final rinse cycle of textile laundry a composition according to any one of claims 1 to 9.
11. A method according to claim 10, wherein the fabric is to be used as a towel.
12. Use of the composition according to any one of claims 1 to 9, in the rinse cycle of a textile laundering operation to provide residual antibacterial activity to the fabric, together with softening.

13. Use of the composition according to any one of claims 1 to 9, to provide residual antifouling activity on the fabric, together with softening.
14. Use of the composition according to any one of claims 1 to 9, essentially as described and with particular reference to the examples.
15. A composition comprising about 0.2% to about 10% of cationic antibacterial agent, together with conventional fabric softener components, for use as an antibacterial activity-imparting agent.

INTERNATIONAL SEARCH REPORT

Application No
PCT/IL 98/00232

A. CLASSIFICATION OF SUBJECT MATTER

IPC 6 C11D3/00 C11D1/62 C11D1/835

According to International Patent Classification(IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

IPC 6 C11D

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	FR 2 298 600 A (HOECHST AG) 20 August 1976 see claims; examples 2,3 see page 4, line 1 - line 9 see page 5, line 13 - line 20 ---	1,2,4,5, 7-12,14, 15
X	GB 1 089 010 A (COLGATE-PALMOLIVE) 1 November 1967 see page 1, column 1, line 28 - line 37; claims ---	1-5, 7-12,14, 15
A	GB 1 538 866 A (HOECHST AG) 24 January 1979 see page 3, line 30 - line 50; claims; examples -----	1-15

Further documents are listed in the continuation of box C.

Patent family members are listed in annex.

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Date of the actual completion of the international search

14 September 1998

Date of mailing of the international search report

28/09/1998

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Patent document cited in search report	Publication date	Patent family member(s)		Publication date
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